UNITED STATES DEPARTMENT OF AGRICULTURE
BUREAU OF ENTOMOLOGY
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To Entomologists of the
Bureau and Cooperating States.

(NOT FOR PUBLICATION)

In connection with the recent communications from this Bureau, on insecticidal residues, you will, we believe, be interested in a statement on the "Poisonous Effects of Lead and Arsenic," prepared, at request, under the direction of W. G. Campbell, Chief of the Food and Drug Administration. This statement follows:

"POISONOUS EFFECTS OF LEAD AND ARSENIC

"Lead and arsenic are known as cumulative poisons; that is, they tend to be stored in the system faster than they are excreted. When the accumulated poison reaches the point where the particular individual is susceptible, definite evidences of poisoning appear. Susceptibility differs with individuals and within recent years evidence has been advanced to show that many persons are susceptible to far smaller traces of these poisons than were earlier believed to have any effect.

"Lead and arsenic poisoning manifest themselves in two ways. Acute poisoning results when relatively large doses of the poisons are taken. Acute lead and arsenic poisoning cases are readily recognized by physicians. They are usually severe and frequently fatal. The residues of lead and arsenic now found on fruits and vegetables are seldom sufficiently large to cause acute poisoning.

"Chronic poisoning results from the continued consumption over a long period of small amounts of the poisons. Chronic arsenic poisoning is manifested by symptoms such as hardening of the skin, loss of the hair, skin eruptions, nerve affections, impairment of sight, and the like, all of which symptoms may be produced by other ailments. Since these symptoms appear gradually rather than suddenly as in the case of acute poisoning, their cause is difficult to recognize and it has only been in the last few years through the work of Myers, Throne and their coworkers, that the prevalence of chronic arsenic poisoning has been recognized.

"Chronic lead poisoning manifests itself in pallor, weakness, digestive and nervous disturbances, wrist and foot drop, stippling of the blood cells and the development of the so-called lead line in the gums. Any or all of these effects may be shown.

"The most striking case of chronic arsenic poisoning on record occurred in England and Wales in 1900 when more than 6,000 persons were affected, including 70 deaths, through the consumption of beer containing traces of arsenic. This outbreak was investigated by a British Royal Commission, headed by Lord Kelvin. The committee found poisonous beer to contain from 1/40 to 1/16 of a grain of arsenic trioxide per gallon. They reported one case of poisoning following the consumption of as low as one single dose amounting to 1/50 grain (1.3 milligrams) of arsenic trioxide. The committee concluded as a result of its investigation that penalties should be imposed under the British statute if beer or any other liquid food or any liquid entering the composition of food, showed 0.01 grain or more of arsenic trioxide to the gallon, and with regard to solid food, no matter whether habitually consumed in large or small quantities or whether taken by itself or mixed with water or other substances, if it contained 0.01 grain of arsenic trioxide or more per pound. The tolerance so established, namely 0.01 grain (1.4 parts per million) As_2O_3 per pound, is the so-called international tolerance, universally recognized by food authorities as governing since that date. The comprehensive report of the Royal Commission with its compilation of definitely proved cases of severe chronic poisoning from arsenic, leaves no doubt as to the soundness of the committee's recommendation for a drastic limitation of arsenic. In fact, the recent work of Myers, Throne and their coworkers has raised the question whether the international tolerance is itself not too lenient rather than too severe.

"Recent data on chronic lead poisoning is summarized in the Journal of Industrial Hygiene for the year 1928 (volume 10, page 234) in a paper by Wright, Sappington and Rantoul. The conclusions are, briefly, these: About 11% of all cases of lead poisoning in the Industrial Clinic of the Massachusetts General Hospital, over the period of 1911-1923, were nonindustrial in origin. One hundred and two cases were from families consuming drinking water flowing through lead pipes. Of all persons exposed, about 25% showed gross symptoms of lead poisoning, namely, a blue line about the gums, stippled blood cells, and in many instances, pallor, weakness, and digestive disturbances. Fourteen persons ingesting as little as 0.1 milligram (about 1/700 grain) daily of lead over an average period of 8-1/4 years, exhibited these symptoms. One moderately sprayed apple might readily contain more than 0.1 milligram of lead unless subjected to appropriate cleansing treatment.

"In the fall of 1931 cabbages were seized in Baltimore by the Federal authorities containing as high as 1.473 grains of As_2O_3 per pound, or 147 times the international tolerance for arsenic. In the fall of 1932, Colorado cauliflower seized in Florida showed a maximum of 1.602 grains As_2O_3 per pound or 160 times the tolerance."

We are advised that, in enforcing the Food and Drug Act, the Food and Drug Administration has continuously secured the advice of qualified specialists on matters pertaining to the poisonous effects of insecticidal residues on food products. Through the information and testimony supplied by these experts -- including such men as Doctor Carlson of the University of Chicago, Doctor Voegtlin of the U. S. Public Health Service, and the late Doctor Loevenhart of the University of Wisconsin -- they have fully substantiated the necessity of the regulations promulgated under the Act and have successfully defended court cases contesting their legality.

S. A. Rohwer,
Acting Chief of Bureau.